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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,258	03/31/2004	Dennis Michael Gray	132407-3	7463

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EXAMINER	
IVEY, ELIZABETH D	

ART UNIT	PAPER NUMBER
1775	

DATE MAILED: 06/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/815,258	GRAY ET AL.	
	Examiner	Art Unit	
	Elizabeth Ivey	1775	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *26-29,32-38 and 41-52* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *29,32-38,41-52 and 126* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 26-29, 32-38, 41-52 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claims 26-29 and 32-34, applicant added a limitation of "wherein the additives are effective to form oxides, borides, nitrides, carbides, phosphides, carbonitrides, oxinitrides and mixtures thereof with the metal ion" to claim 26, 35, and 45. This limitation has not been identified by applicant and can not be located by the examiner within the specification and is therefore considered new matter.

Regarding claims 35-38 and 41-44, applicant added a limitation of "wherein the additives are selected to form carbides, borides, nitrides, or oxides with the metal ion" to claim 35. This limitation has not been identified by applicant and can not be located by the examiner within the specification and is therefore considered new matter.

Regarding claims 45-52, applicant added a limitation of "wherein the additives are selected to form carbides, borides, nitrides, oxides, carbonitrides and oxinitrides " to claim 45. This limitation has not been identified by applicant and can not be located by the examiner within the specification and is therefore considered new matter.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 26-29, 32-34, 45-52 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 26 and 45 and their dependent claims as written claim inclusive sets of carbides, oxides, nitrides, borides etc. It is not clear whether applicant means to claim them inclusively or in the alternative as a Markush group in each independent claim. Further clarification is required. Examiner will treat them as intending to be in the alternative.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 26-29, 32-34 and 45-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 3,762,882 to Grutza in view of U.S. Patent 4,305,792 to Kedward et al., further in view of U.S. Patent 4,833,041 to McComas further in view of U.S. Patent 6,372,012 B1 to Majagi et al. For purposes of furthering examination, examiner interprets limitations as can best be determined by the specification with regard to additives and with regard to oxides, nitrides,

carbides, phosphides, carbonitrides, oxynitrides and mixtures thereof on page 10 paragraph [0028].

Regarding claims 26, 45, 46, 48 and 52, examiner notes that oxides, nitrides, carbides, phosphides, carbonitrides, oxynitrides and mixtures thereof are used in the alternative in the specification only in regard to nanoparticle additions rather than additives that form these products. Examiner will treat the limitations as can best be interpreted as disclosed by the specification. Grutza discloses an electroplating process, which can be used to make articles such as engine components, involving suspending diamond particles in an aqueous solution containing metal sulfates such as nickel sulfate with various additives (column 2 lines 8-14, 30-36 and 41-48 and column 6 lines 48-52, column 7 lines 14-22). The process further involves an article, immersed in the solution and agitated, viz. rotated then halted when the solution is electrolyzed (column 1 lines 50-54-56 and column 2 lines 67-68 and column 3 lines 1-6). Grutza does not specifically disclose deionized water but because the bath is a chemical bath relying upon ionization, it would have been obvious to any person having ordinary skill in the art at the time of the invention to use deionized water. Grutza does not disclose electroless plating or a hypophosphite solution but Kedward discloses a similar plated article made by either electroplating or electroless plating using a hypophosphite solution. Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to use a hypophosphite solution in an electroless plating process to produce the same plating as Grutza produced with the electroplating process since electroplating and electroless plating are used interchangeably to plate such materials as indicated by Kedward. Neither Grutza nor Kedward

fully detail the electroless plating process and do not disclose heating the bath for processing. However, McComas discloses, in more detail, an electroless plating process used to produce wear resistant alloy coatings and discloses that in a typical process the article is immersed in a hot bath at 180-210°F or about 82-99°C (column 5 lines 5-7). Although not specifically disclosed, it would have been obvious to any person having ordinary skill in the art at the time of the invention to remove the article from the bath in order to use it. Neither Grutza nor Kedward disclose heating the component after removal from the bath. However, McComas discloses that heat treatment of the coated article can increase the hardness of the coating and discloses heat treating after coating at temperatures ranging from 375 to 750°F depending on the time at temperature resulting in a Knoop of 1000 or approximately 7 on the Mohs scale of hardness. Because McComas discloses a typical heat treating process for a wear resistant alloy coating, it would have been obvious to a person having ordinary skill in the art at the time of the invention to incorporate the heating of the bath and the heat treatment of the article after coating of McComas with the materials of Grutza and Kedward to create a superhard particle and metal matrix coating for an engine component by an electroless plating process. Grutza discloses particle diameters of .01 - 30μm in diameter including nanoparticles between 1 and 100nm in diameter as defined on page 10 in paragraph [0028] of the applicant's specification (column 1 lines 6-8). Grutza, Kedward and McComas do not disclose nanoparticles comprising carbides, borides, nitrides or oxides with at least one metal selected from a group of metals consisting of Al, Si, W, Cr, Ti, Nb, Zr, Hf, Ta, and Mo. However, Grutza discloses particle diameters of .01 - 30μm in diameter including nanoparticles between 1 and 100nm in diameter as defined on page 10 in paragraph [0028] of the applicant's specification (column 1 lines 6-8). Majagi discloses

the use of electro and electroless plating methods to apply a coating of particles comprising carbides, borides, nitrides or oxides of elements such as Al, Si, W, Cr, Ti, Nb, Zr, Hf, Ta, and Mo by using particle of the same size as the hard particles such as the diamond particles of Grutza which include nanoparticles (column 5 lines 43-51, column 6 lines 1-3, column 7 lines 8-16, column 8 lines 40-45 and column 9 lines 33-63). Majagi discloses the use of these materials to form "superhard" coatings with good particulate bonding with the matrix and fewer coating flaws (column 6 lines 4-15). Therefore, it would have been obvious to any person having ordinary skill in the art at the time of the invention to use the materials of Majagi in the process of Grutza Kedward and McComas to create a superhard coating with good particulate bonding with the matrix and fewer coating flaws. Additionally, because Grutza Kedward McComas and Majagi disclose all of the process limitations, although the formation of nanoparticles of the metal ion and an additive in situ is not disclosed explicitly by Majagi, these particles are products that would inherently be formed by the combined process as indicated.

Regarding claims 27 and 50, Grutza, Kedward, McComas and Majagi disclose all of the limitations of claims 26 and 45 but do not expressly disclose a distance between particles of equal to or less than 10μm. However Grutza does disclose an even and uniform distribution of diamond particles ranging in size from .01 - 30μm in diameter and densities of 1-20 g/l of diamonds dispersed in the matrix (column 1 lines 6-8 and 65-67 and examples in columns 4-6). Grutza also discloses that the concentration of diamond particles depends upon the type of bath in which they are dispersed and the density of the diamonds desired in the matrix (column 3 lines

13-15). Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to optimize the desired size and volume of diamonds to arrive at a distance between particles of equal to or less than 10μm or 5μm for the particular application.

Regarding claims 28 and 29, Grutza, Kedward, McComas and Majagi disclose all of the limitations of claim 26 and McComas discloses replenishing the bath to maintain a preferred concentration range for the metal ion components (column 5 lines 25-48). Although Grutza, Kedward and McComas do not expressly disclose a metal ion concentration of 5.5 – 6.3 g/l of bath solution, however Grutza does disclose 20 g/l of metal ion (column 3 line 15-17). It would have been obvious to a person having ordinary skill in the art at the time of the invention to adjust and replenish the bath to maintain the metal ion concentration for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 47, Grutza, Kedward, McComas and Majagi disclose all of the limitations of claims 26 and 45 and Grutza discloses H_3BO_3 additions to the solution (column 4 example 1 and column 6 lines 52-53).

Regarding claims 32 and 49, Grutza, Kedward, McComas and Majagi disclose all of the limitations of claims 26 and 45 and Grutza discloses volume fractions of hard particle of 40% (column 3 line 13-19).

Regarding claim 33, Grutza, Kedward, McComas and Majagi disclose all of the limitations of claim 26 but do not expressly disclose a distance between particles of equal to or less than 10μm, however Grutza does disclose an even and uniform distribution of diamond particles ranging in size from .01 - 30μm in diameter and densities of 1-20 g/l of diamonds dispersed in the matrix (column 1 lines 6-8 and 65-67 and examples in columns 4-6). Grutza also discloses that the concentration of diamond particles depends upon the type of bath in which they are dispersed and the density of the diamonds desired in the matrix (column 3 lines 13-15). Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to optimize the desired size and volume of diamonds to arrive at a distance between particles of equal to or less than 10μm or 5μm for the particular application.

Regarding claims 34 and 51, Grutza, Kedward, McComas and Majagi disclose all of the limitations of claims 26 and 45 and Grutza discloses a coating thickness which may vary anywhere from .000039 – 0.25 inches which includes greater than 25μm (column 8 lines 28-31).

Claims 35-37, and 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 3,762,882 to Grutza in view of U.S. Patent 6,372,012 B1 to Majagi et al. further in view of U.S. Patent 4,833,041 to McComas.

Regarding claim 35, Grutza discloses an electroplating process involving suspending diamond particles in an aqueous solution containing metal sulfates (column 2 lines 8-141-6 and 41-48 and column 6 lines 48-52, column 7 lines 14-22). Grutza discloses particle diameters of

.01 - 30μm in diameter (column 1 lines 6-8) including nanoparticles between 1 and 100nm in diameter as defined on page 10 in paragraph [0028] of the applicant's specification. The process further involves an article, which is made to act as a cathode and immersed in the solution and agitated, viz. rotated then halted when the solution is electrolyzed (column 1 lines 50-54-56 and column 2 lines 67-68 and column 3 lines 1-6). A current is then run through the bath thereby forming a hard particle and metal coating (column 8 lines 43-47). Grutza does not specifically disclose deionized water but because the bath is a chemical bath relying upon ionization, it would have been obvious to any person having ordinary skill in the art at the time of the invention to use deionized water. Grutza does not disclose nanoparticles comprising carbides, borides, nitrides or oxides with at least one metal selected from a group of metals consisting of Al, Si, W, Cr, Ti, Nb, Zr, Hf, Ta, and Mo however Majagi discloses the use of electro and electroless plating methods to apply a coating of particles comprising carbides, borides, nitrides or oxides of elements such as Al, Si, W, Cr, Ti, Nb, Zr, Hf, Ta, and Mo by using particle of the same size as the hard particles such as the diamond particles of Grutza which include nanoparticles (column 5 lines 43-51, column 6 lines 1-3, column 7 lines 8-16, column 8 lines 40-45 and column 9 lines 33-63). Majagi discloses the use of these materials to form "superhard" coatings with good particulate bonding with the matrix and fewer coating flaws (column 6 lines 4-15). Therefore, it would have been obvious to any person having ordinary skill in the art at the time of the invention to use the materials of Majagi in the process of Grutza to create a superhard coating with good particulate bonding with the matrix and fewer coating flaws. Although not specifically disclosed it would have been obvious to any person having ordinary skill in the art at the time of the invention to remove the article from the bath in order to use it. Neither Grutza

nor Majagi disclose heating the component after removal from the bath. However, McComas discloses that heat treatment of a coated article can increase the hardness of the coating and discloses heat treating after coating at temperatures ranging from 375 to 750°F depending on the time at temperature resulting in a Knoop of 1000 or approximately 7 on the Mohs scale of hardness. Because McComas discloses a typical heat treating process for a wear resistant alloy coating, it would have been obvious to a person having ordinary skill in the art at the time of the invention to incorporate the heating of the bath and the heat treatment of the article after coating of McComas with the materials of Grutza and Majagi to create a superhard particle and metal matrix coating for an engine component by an electroless plating process. Additionally, because Grutza Kedward McComas and Majagi disclose all of the process limitations, although the formation of nanoparticles of the metal ion and an additive in situ is not disclosed explicitly by Majagi, these particles are products that would inherently be formed by the combined process as indicated.

Regarding claim 36, Grutza and Majagi and McComas disclose all of the limitations of claim 35 but do not expressly disclose a distance between particles of equal to or less than 10μm, however Grutza does disclose an even and uniform distribution of diamond particles ranging in size from .01 - 30μm in diameter and densities of 1-20 g/l of diamonds dispersed in the matrix (column 1 lines 6-8 and 65-67 and examples in columns 4-6). Grutza also discloses that the concentration of diamond particles depends upon the type of bath in which they are dispersed and the density of the diamonds desired in the matrix (column 3 lines 13-15). Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to

optimize the desired size and volume of diamonds to arrive at a distance between particles of equal to or less than 10μm or 5μm for the particular application.

Regarding claim 37, Grutza and Majagi and McComas disclose all of the limitations of claim 35 but Grutza and Majagi and McComas do not specifically disclose a metal ion concentration of 5.5 – 6.3 g/l of bath solution, however Grutza does disclose 20 g/l of metal ion (column 3 line 15-17). It would have been obvious to a person having ordinary skill in the art at the time of the invention to adjust the metal ion concentration for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 39, Grutza and Majagi and McComas disclose all of the limitations of claim 35 and Grutza discloses H_3BO_3 additions to the solution (column 4 example 1 and column 6 lines 52-53).

Regarding claim 41, Grutza and Majagi and McComas disclose all of the limitations of claim 35 and Grutza discloses volume fractions of hard particle of 40% (column 3 line 13-19).

Regarding claim 42, Grutza and Majagi and McComas disclose all of the limitations of claim 26 but do not expressly disclose a distance between particles of equal to or less than 10μm, however Grutza does disclose an even and uniform distribution of diamond particles ranging in size from .01 - 30μm in diameter and densities of 1-20 g/l of diamonds dispersed in the matrix

(column 1 lines 6-8 and 65-67 and examples in columns 4-6). Grutza also discloses that the concentration of diamond particles depends upon the type of bath in which they are dispersed and the density of the diamonds desired in the matrix (column 3 lines 13-15). Therefore it would have been obvious to a person having ordinary skill in the art at the time of the invention to optimize the desired size and volume of diamonds to arrive at a distance between particles of equal to or less than 10μm or 5μm for the particular application.

Regarding claim 43, Grutza and Majagi and McComas disclose all of the limitations of claim 35 and Grutza discloses a coating thickness which may vary anywhere from .000039 – 0.25 inches which includes greater than 25μm (column 8 lines 28-31).

Regarding claim 44, Grutza and Majagi and McComas disclose all of the limitations of claim 35 and Grutza discloses diamond particles, whose inherent hardness is 10 on the Mohs scale as confirmed known to the applicant on page 5 paragraph [0016] of the applicant's specification (column 1 lines 51-54).

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 3,762,882 to Grutza in view of U.S. Patent 6,372,012 B1 to Majagi et al. further in view of U.S. Patent 4,833,041 to McComas and further in view of U.S. Patent 3,061,525 to Grazen et al.

Regarding claim 38, Grutza and Majagi and McComas disclose all of the limitations of claim 35 but do not specifically disclose replenishing the bath to maintain a metal ion concentration of 5.5 – 6.3 g/l of bath solution. However Grutza does disclose 20 g/l of metal ion (column 3 line 15-17). Additionally, Grazen discloses adjustment and replenishment of the bath as a normal part of the electroplating process (column 6 lines 50-58). It would have been obvious to a person having ordinary skill in the art at the time of the invention to replenishment of the bath as a normal part of the electroplating process and to adjust the metal ion concentration for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

Examiner acknowledges applicant's amendments of claims 26, 35, and 45 and additional cancellation of claims 1-9, 11-20, 22-25, 30-31, 39 and 54 for a combined cancellation of claims 1-25, 30-31, 39-40 and 53-54 to date. Examiner subsequently withdraws the objection to claim 1.

Applicant's arguments with respect to claims 1-9, 11-20, 22-39, 41-52 have been considered but are moot in view of the new ground(s) of rejection.

Regarding applicants argument that none of Grutza, Majagi, Kedward or McComas disclose the elements of claims 26, 35 and 45 particularly with regard to forming nanoparticles of

an additive and a metal ion in situ upon heat treatment is not convincing because it is not per se part of the process but a result of the process. Applicant has not shown that the process is not disclosed by the aforementioned references, therefore because the process is disclosed the product of the process would necessarily be produced. Additionally claims 26, 35, and 45 are rejected for new matter.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Ivey whose telephone number is (571) 272-8432. The examiner can normally be reached on 7:00- 4:30 M-Th and 7:00-3:30 alt. Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571) 272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elizabeth D. Ivey

JENNIFER C. MCNEIL
SUPERVISORY PATENT EXAMINER
6/15/06